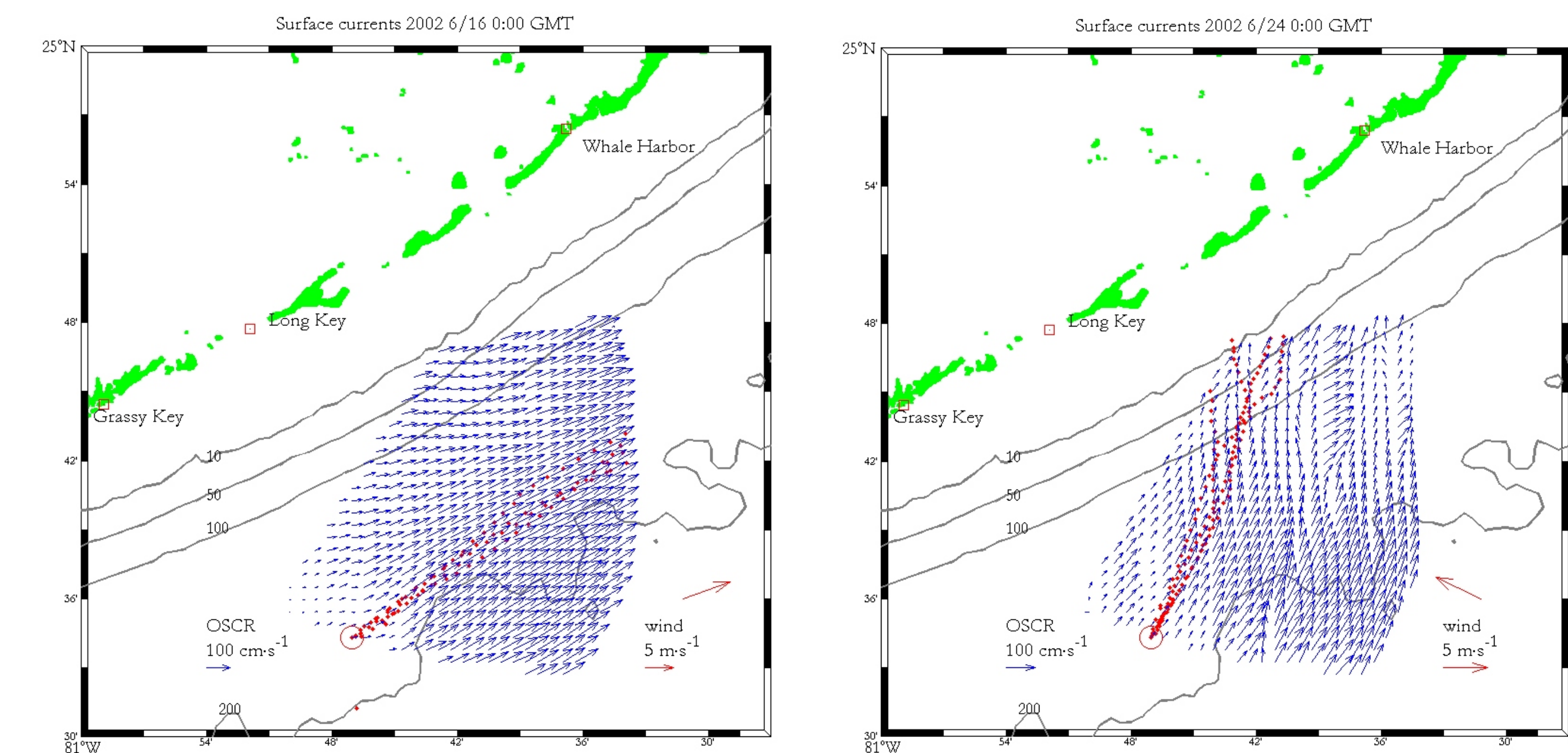


LARGE EDDY, SMALL EDDY – SUPPLYING RECRUITS TO THE SOUTH FLORIDA ECOSYSTEM

Synopsis

Eddies are often associated with larval transport and nutrient enhancement in the coastal marine ecosystem. Mesoscale eddies are active along the Loop Current–Florida Current front from the eastern Gulf of Mexico to the Straits of Florida. A Loop Current frontal eddy frequently becomes trapped offshore of the Dry Tortugas archipelagos, where the Loop Current turns into the Florida Current, for periods of 1–3 months. The Dry Tortugas is a critical marine ecological reserve and known spawning ground for species of snappers (*Lutjanus* spp.), pink shrimp (*Farfantepenaeus duorarum*), and the spiny lobster (*Panulirus argus*).

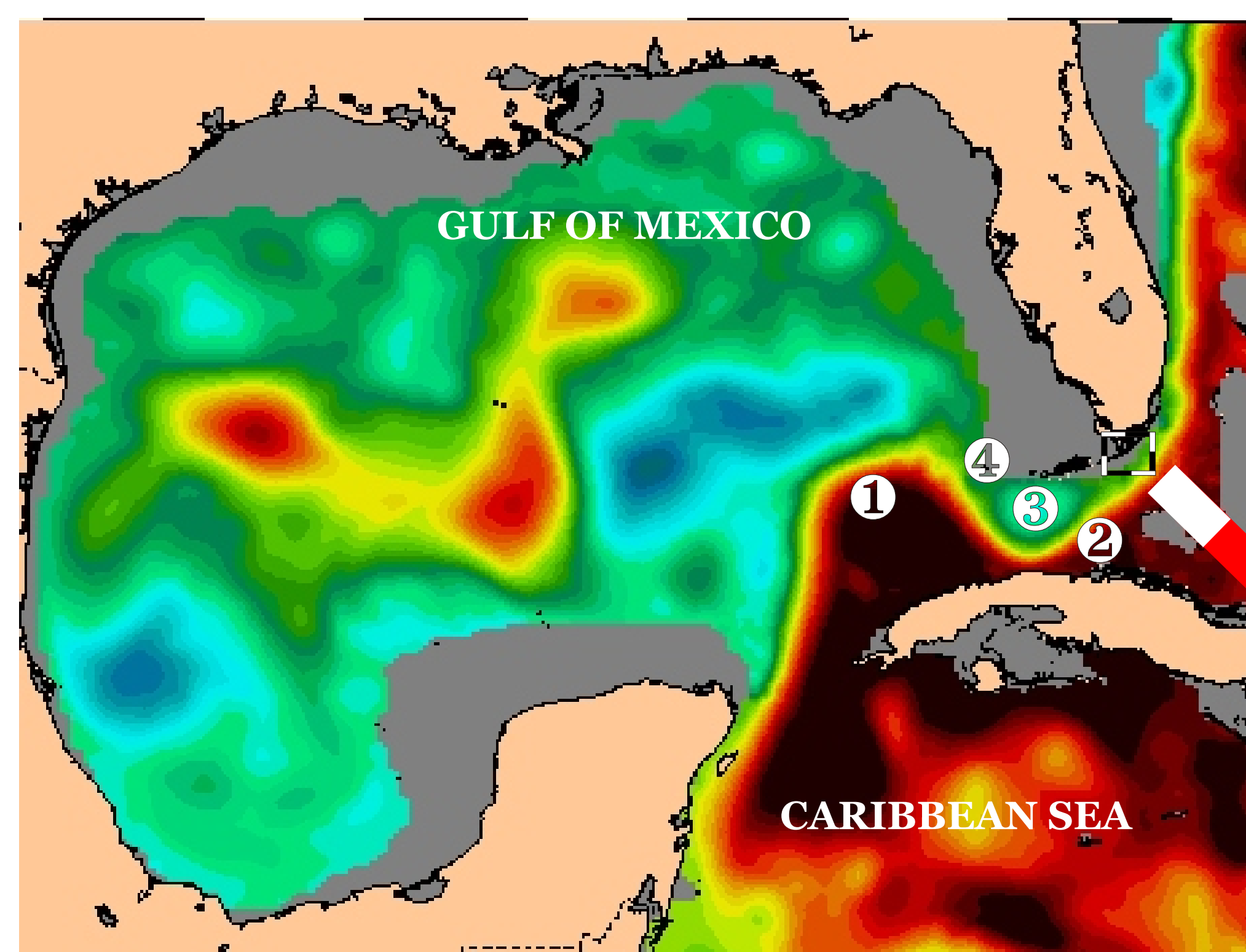
Eventually, expelled by the arrival of another frontal eddy or released by the southward retreat of the Loop Current, the Tortugas eddy propagates eastward and downstream towards the coastal waters of the Florida Keys. The eddy progressively shrinks and ultimately disintegrates. Inter-island channels along the Florida Keys lead into Florida Bay, a key nursery habitat for the aforementioned species. The eddy process provides a possible mechanism for the retention and nourishment of early life stages at the spawning ground, and subsequent delivery to the nursery. To investigate this hypothesis, we followed the evolution of the Tortugas eddies using satellite SST and SSH imagery, and sampled within and around these eddies on several occasions.



3

Question: What happens in the coastal oceanography with the passage of an eddy?

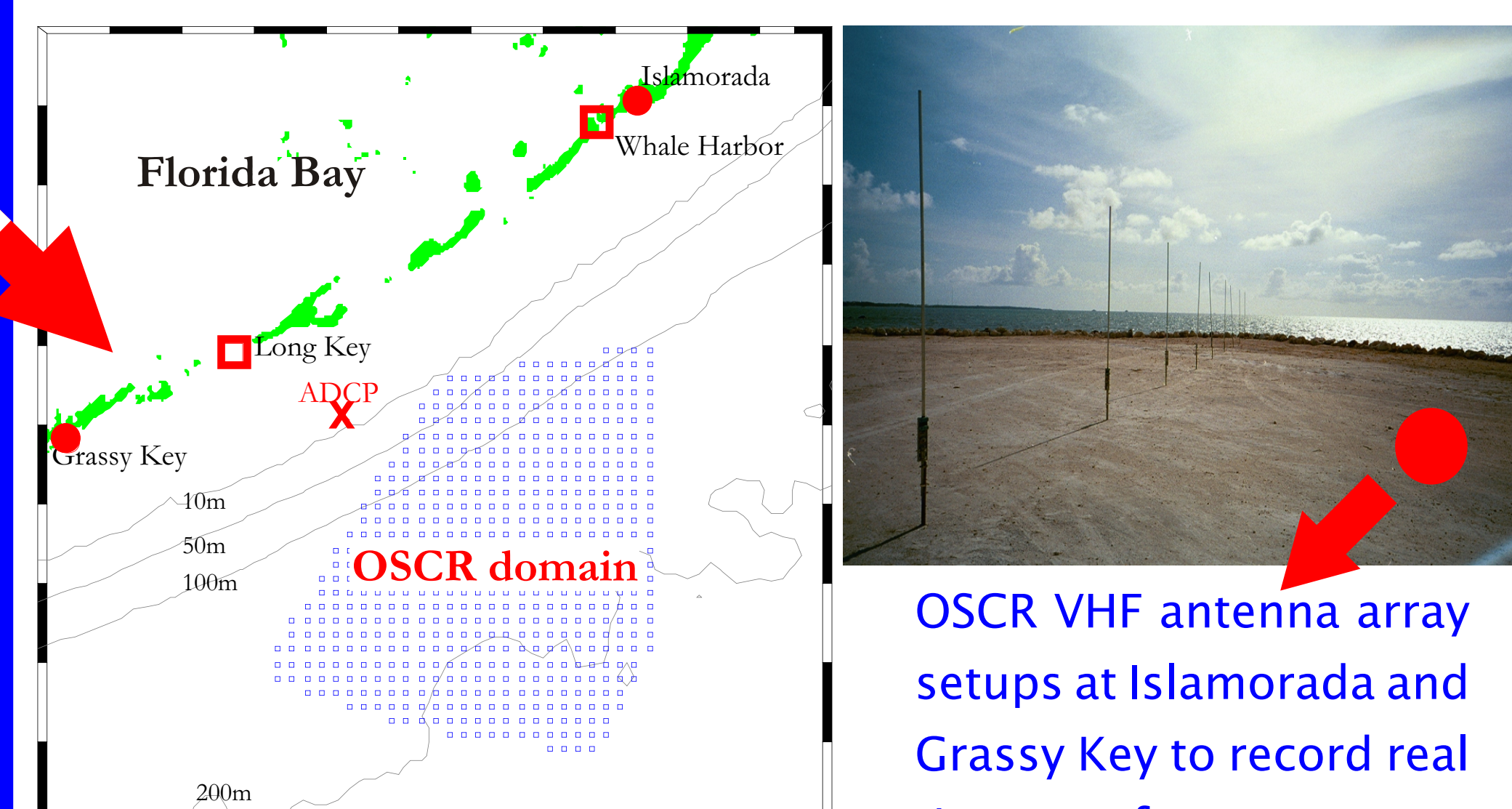
The Florida Current dominated coastal flow in the middle of June, as exemplified in the surface current field on June 16, 2002. Trajectories of simulated drifters released at \circ tend to exit alongshore and downstream. On the contrary, the current field on June 24, 2002 exemplifies a period of onshore convergence (passage of eddy?) at the end of June, when drifters tend to move onshore.



1

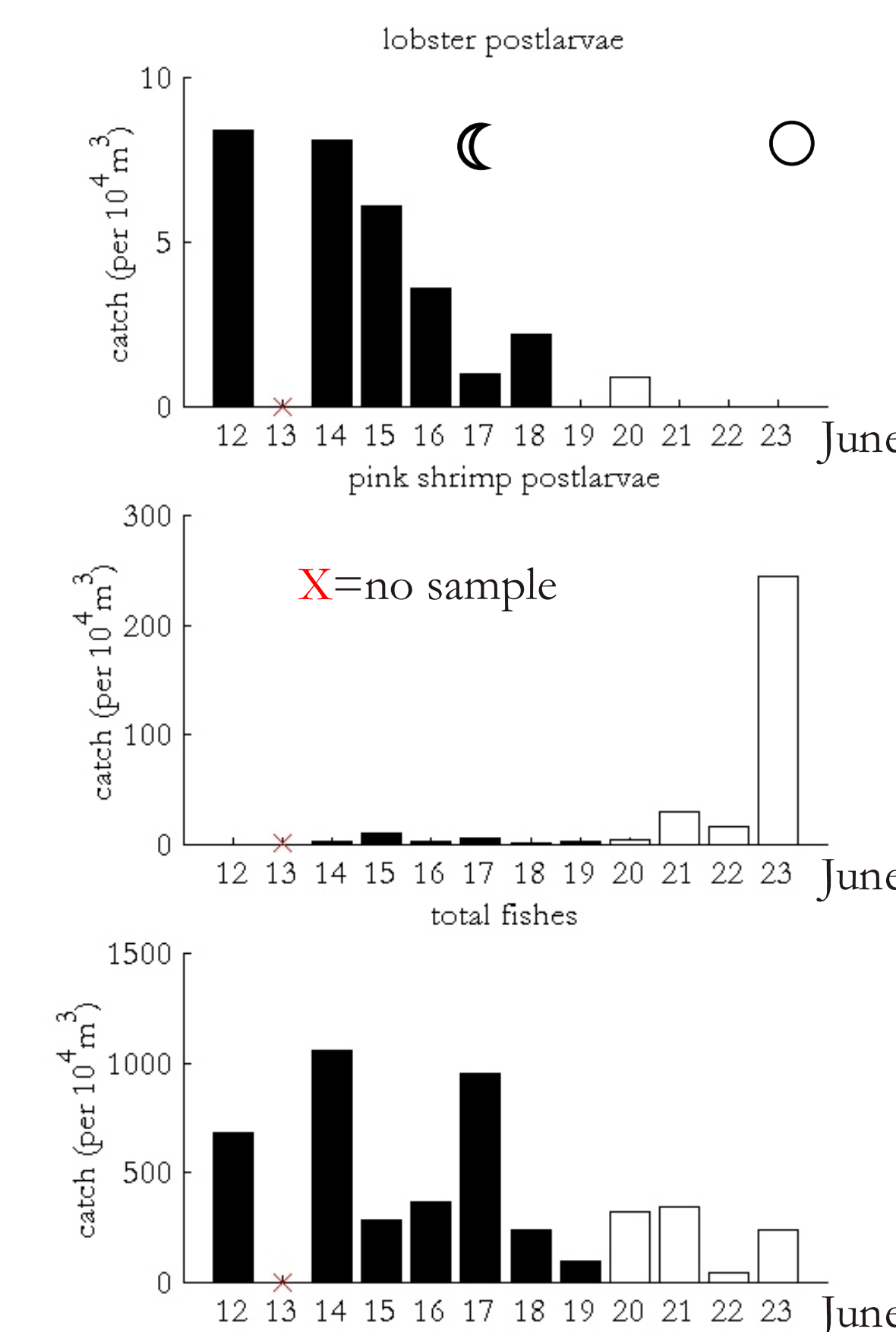
Regional sea surface height (SSH) on May 12, 2002, a product of the Navy Layered Ocean Model (NLOM) that incorporates atmospheric forcing and satellite altimeter and sea surface temperature (SST) data. Red tones depict warmer water and blue tones depict colder water. ① – Loop Current; ② – Florida Current. The cold-core signature of a cyclonic eddy ③ was situated east of the Dry Tortugas ④. Our objective was to follow the development of this eddy as it propagates downstream.

In anticipation of the eddy's passage offshore of the Florida Keys, an Ocean Surface Current Radar (OSCR) array was set up to record in real time the expected alongshore current reversal and enhanced onshore flow brought on by the leading edge of the eddy. Channel nets were deployed inshore of the OSCR domain at channels connecting coastal waters and Florida Bay to monitor the onshore transport of pre-settlement stages.



OSCR VHF antenna array setups at Islamorada and Grassy Key to record real time surface currents.

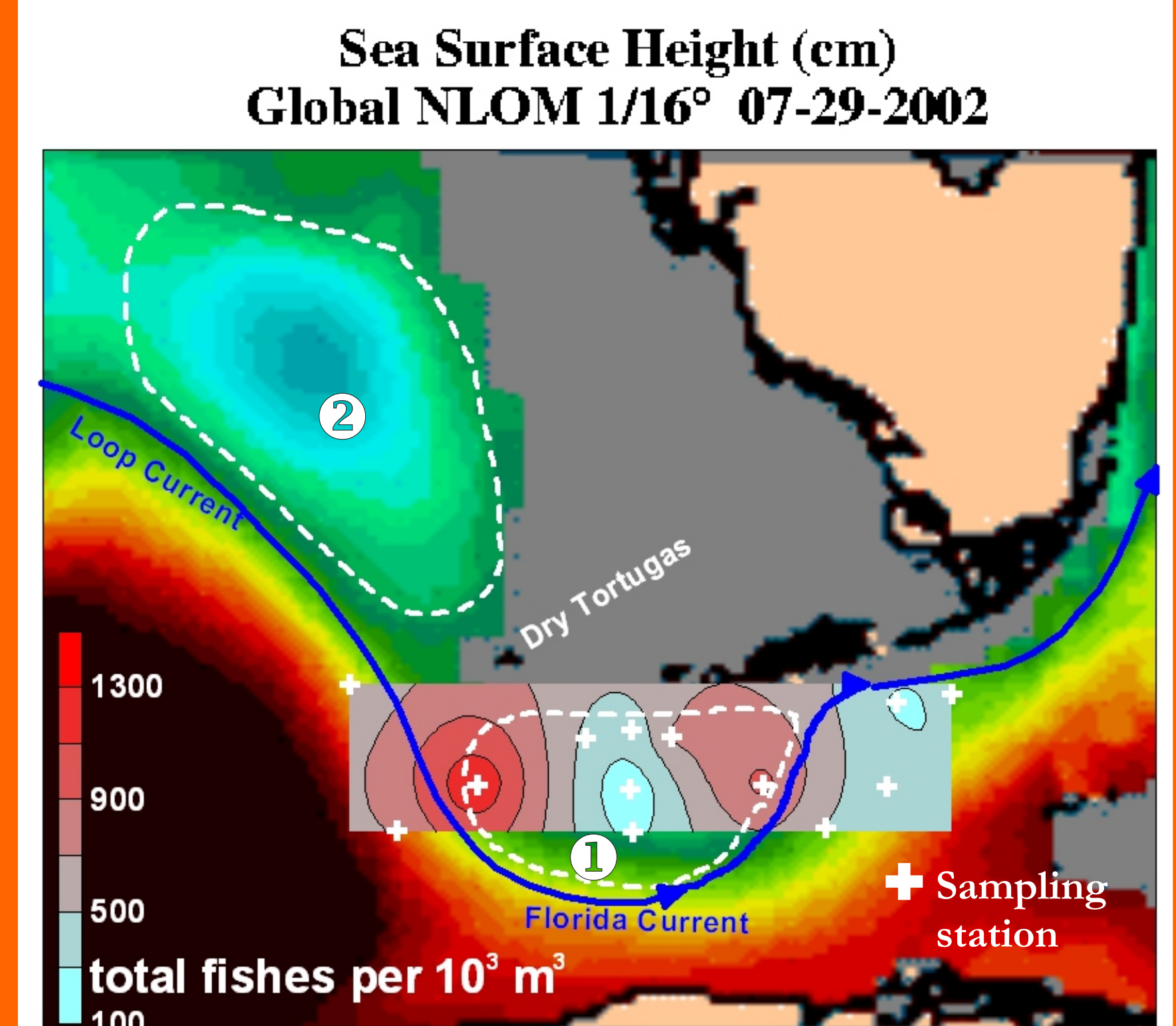
Channel nets respectively moored at Long Key and Whale Harbor to monitor influx of pre-settlement stages.



4

Question: How does the eddy affect onshore transport of different species?

Densities of spiny lobster, pink shrimp, and fish larvae captured at Long Key channel between June 12–23, 2002. Black bar – Florida Current period; white bar – onshore convergence period (see 3). ☾ – 1st quarter; ○ – full moon.



5

Question: What is entrained and transported by the eddy from upstream?

The eddy ① still appeared intact when it was surveyed in August, 2002, while another frontal eddy ② is approaching from upstream. Contours of total fish larvae density in the Dry Tortugas and in the eddy are superimposed on SSH model.



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